

# Nutrition for the Later Years of Life

By ANCEL KEYS, Ph.D.

"Nutrition for the later years of life" implies that older people have special nutritional problems simply because they are older. The suggestion is that dietary practices considered good for younger adults may not fit precisely the needs of older people. Actually, there is practically no evidence that age, by itself, produces nutritional problems which do not have their counterparts at all ages in adult life. However, the frequency of certain problems changes with age and there are some general trends which need attention from those who advise or care for elderly persons, as well as from the elderly person himself.

It is impossible to specify any particular age to which this discussion applies, or begins to apply. Physiological age and a mode of life cannot be predicted from age in years alone. A part of the "old age problem" in the United States is the result of an overemphasis on years as a measure of biological status.

We are concerned here with individuals who have definitely reached the period of a substantial decline in physical vigor and activity, who have established relatively rigid patterns of food habits, and whose life experience has allowed the accumulation of some of the infirmities we associate with old age. For the individual, this age may start at 40 years, or it may be postponed to 70 or more; commonly, it is reached in the sixties.

There is no specific nutritional problem in old age nor any specific dietary recipes for the pres-

ervation of vigor or the extension of life in the aged. Throughout history and in all parts of the world, special diets—foods to eat or not to eat, foods in particular combinations or sequences—have been offered to a wishful and gullible public for the prevention or "cure" of the changes in physical and mental capacity associated with growing old. When there is an abundance of food, as there is in the United States, the scope for the food faddists is unlimited.

Part of the problem of providing nutritional help for older persons consists in countering the claims of the food faddists, the purveyors of special nostrums offered for nutritional purposes, and the writers who find a ready sale for books and articles promising miracles from peculiar diets. The older person who observes deteriorative changes in himself is especially vulnerable; the greater the loss of the sense of well-being, the stronger is the urge to believe any promise of help. Some highly publicized diets and nutritional "treatments" may be harmful, but the majority are not really dangerous. The main objection to false propaganda about nutrition is that it interferes with the teaching and understanding of sound nutrition. The primary means of improving nutrition, even with the aged, must be education.

Decreased physical activity of the older person indicates that there must be a quantitative change in nutritional requirements, at least in calories. Changes in body size and in basal metabolism also point to decreased total food needs. Decreased food consumption is, as it should be, the rule. However, with decreased total food consumption, the pattern of the remaining diet may represent an unfortunate selection; therein lies one basis for malnutrition.

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## Malnutrition Among Aged Persons

It is frequently said that malnutrition is much more common among aged persons than in the rest of the population, but there is little real evidence on the subject. Surveys of food consumption purporting to show a high incidence of dietary inadequacy in older persons use arbitrary standards of nutritional "requirements" which may be excessive for the whole population and which make no concession to the fact that the older person represents a smaller and considerably less active metabolic machine.

Nevertheless, it is possible that the incidence of malnutrition is relatively high among older people. A large proportion of elderly people have chronic disorders or diseases; some of these tend to promote malnutrition, particularly by restricting the choice of foods. Missing teeth, faulty dentures, slow digestion, and diminished taste acuity contribute to change the choice of foods. Dysentery or other diseases may cause inefficient intestinal absorption which, in turn, may reduce the actual nutrient supply to the tissues.

While the foregoing factors may have great importance in some individuals, it is probable that more purely psychological and sociological factors are influential in inducing malnutrition in older persons. A reduction in calorie needs is usually accompanied by a reduction in food interest, particularly for food variety, so that many older persons incline to progressive simplification and monotony in their self-selected diets.

When elderly persons prepare their own meals, easy availability and ease of preparation may dominate food selection, with resulting neglect of nutritional quality. This is often true in the older person who lives alone. In many communities the most extreme cases of malnutrition are seen in two classes of people—alcoholics and elderly recluses—both of whom tend to great oversimplification of the diet.

Economic factors are also important in malnutrition among older persons. At the present time, a large proportion of aged persons in the United States have totally inadequate economic resources; their meager savings, fixed incomes, and pensions are insufficient to adjust to rising

food costs except through drastic curtailment of food expenditures. This usually means less of the "protective foods"—meats, dairy products, fresh vegetables, and fruits—with replacement by cheaper items such as bread, potatoes, and sweets. A similar pattern is often seen in boarding houses and homes for the aged, where the necessity of operating on a limited budget leads to a qualitative nutritional minimum.

The kinds of malnutrition found in older persons are those found at all ages of adulthood. The older person tends to follow the dietary pattern of the community rather than any special pattern of old age. For example, if the community dietary pattern is conducive to pellagra, then pellagra will be found frequently in the older members of that community. There is, however, an important qualification. The older person tends to follow the dietary pattern of the years when his own life habits were being formed. This in itself may account for more malnutrition in older people than in the rest of the community who profit more from the advance of nutritional knowledge. Grandmother did not grow up eating oranges and hence is not in the habit of eating citrus fruit; grandfather was not reared to eat what he may term "rabbit food" and so is not interested in salads and green vegetables.

## Calorie Needs

The basal metabolic rate declines steadily with age. At equal body size (surface area), the decline is of the order of 3 to 5 percent per decade beyond the age of 50 years. Moreover, in old age the body size diminishes, both in weight and in height, so that the estimated decline in that portion of the individual's calorie needs which pertains to basal metabolism is about 5 percent for every 10 years.

In young adults, physical activity accounts for at least half of the total calorie needs, and in some individuals two-thirds or more of the total energy expenditure is due to physical activities. This energy expenditure is reduced progressively beyond the twenties, but a more striking diminution in physical activity occurs when real old age sets in. The aged person rarely engages in manual labor, for the good reason that he is seldom capable of it, and his various infirmities

incline him to a sedentary life. Unnecessary activity is avoided, and movements are deliberate. There are exceptions, of course, but the general rule is a great reduction in calorie needs as compared to those of young or even middle-aged adults.

Records of food consumption under controlled conditions provide detailed confirmation to what is generally known from ordinary observation. Body weight in elderly people is often maintained with intakes of 1,500 calories or less in women and 2,000 calories or less in men. These low intakes are not a cause for concern so long as body weight and nitrogen balance are maintained. Unless the person is already unduly thin, some small progressive weight and nitrogen loss is to be expected, because the aged person certainly does not maintain—and cannot have—the muscle mass of 40 years earlier. If the body weight at age 70 is the same as that at age 40, it is almost certain that there has been a large gain of fat.

### **Obesity**

Calorie undernutrition, of course, can and does occur in old people, but in the United States the opposite form of malnutrition—obesity—is far more common and troublesome. Insistence that elderly people should continue to eat as they did when younger is one of the more dangerous implications of the publication of tables of calorie “requirements” which make no allowance for changed conditions in the later years of life.

Obesity is a double handicap to older people. First, an undue burden of sheer weight must be moved by muscles—including the heart muscle—that are becoming progressively weaker. Second, obesity is a health hazard of great consequence, because the continuance of vigor and of life itself in the elderly is a contest against the progress of the so-called degenerative diseases, particularly diseases of the cardiovascular system and diabetes, and obesity very clearly seems to promote these. Cancer and the other neoplastic diseases are likewise special enemies of the aged, but a direct implication of obesity in them has not been proved. In animals, however, chronic undernutrition exerts a protective action against cancer.

### **Dietary Needs**

Nutritional needs of older people, then, are not different in kind but only in amount; proteins, fats, carbohydrates, vitamins, minerals, and salts, all have their place in the diet.

#### *Proteins*

It is currently customary to insist on a relatively high protein intake for old people. Actually, there is no evidence that the old man's protein needs are higher than those of the young man; indeed, it is possible that the older person may actually “require” slightly less protein than he did earlier in life. This would follow, perhaps, from realization that in old age progressive muscular atrophy is yielding some endogenous nitrogen which might serve other purposes in the body; the amount is trifling, however, and seldom could exceed the equivalent of 5 pounds of lean meat in a year.

The recommendation of a generous protein intake is defensible on the grounds that one should combat a common tendency of old people to choose a very high carbohydrate diet—grandmother's “tea and toast” regimen—and that high-fat diets are specifically objectionable for the aged. General rules may be inapplicable to some individuals, but it appears that a daily allowance of 1 gm. of protein per kilogram of body weight is at least as adequate for the old as it is for the young. Furthermore, it is wise to insist that several different food sources make substantial contributions to the total protein intake. The rule of variety in the diet is useful here, since it helps to assure adequacy of other nutrients.

#### *Fats*

Strictly nutritional evidence points to a small need for dietary fats as such. In human diets, fats are important as a source of calories, as a vehicle or aid for absorption of fat-soluble vitamins, and for their effects on flavor and consistency of foods. Commonly, American diets seem to provide 30 to 40 percent of their calories in the form of extractable fats (and oils), but this percentage could be lowered substantially without any necessary nutritional harm. Since fats are reported to cause “indi-

gestion" in the elderly, and there are other reasons for recommending a low-fat diet in this age group, the limitation of fat intake to 15 to 25 percent of total calories seems reasonable.

### *Carbohydrates*

It would seem enough to advise limitation on the most highly refined carbohydrate foods—sugar and white flour—in favor of more natural mixtures of nutrients. These impose less violent loads on the sugar-regulating machinery of the body and are less apt to produce digestive disturbances in persons who suffer from sluggish digestive processes.

### *Vitamins*

The vitamin needs of older persons are, if anything, less well known than those for younger persons. There is a very large margin of uncertainty as to what amounts of the several vitamins are definitely required and what additional amounts are useful in any way. Since older people generally tend to show greater variability at the same age than do younger people, it is reasonable to suspect that they have large individual variability of vitamin needs.

In recent years there have been some attempts to show that older people have, on the average, relatively high vitamin requirements. Although these studies have yielded much valuable information, they have signally failed to establish the general thesis of elevated vitamin needs in the aged. On the other hand, there is no evidence of diminished needs with advancing age except, perhaps, for those vitamins which are required in proportion to the total metabolism or to the total carbohydrate metabolism. Thiamine seems to belong in this class, and perhaps riboflavin and niacin may be included because they participate in carbohydrate metabolism. But the safest course is to provide all of the vitamins in amounts that would be considered appropriate for younger people.

### *Minerals*

Many of the foregoing remarks about vitamins could be applied with small change to the mineral needs of older people.

Attention is usually concentrated on iron and calcium for the aged. A mild anemia, which

may respond to iron therapy, is common in older people. In these cases it is probable that low iron intake is responsible rather than an elevated need for minerals in elderly persons. A diet with a good provision of lean meat, liver, eggs, whole wheat, leafy green vegetables, and dried fruits—raisins, peaches, apricots—will supply ample iron as well as the trace elements (copper, cobalt) which are necessary for blood building.

The calcium problem is not quite so simple. Progressive demineralization of the bones is a characteristic of old age, or at least of extreme old age. Whether this can be prevented by extra calcium in the diet is highly questionable. In some cases of rather similar but more definite bone disorders, such as hunger osteopathy, extra calcium seems to be far less beneficial than prolonged treatment with vitamin D. But there is no evidence that vitamin D is useful in retarding or preventing demineralization in the aged. Conclusions based on the measurement of calcium excretion in older people are likewise questionable in the absence of data to show that extra calcium influences in any way the long-range calcium balance in old age. There is much evidence to show that experiments of a few days or weeks may be totally misleading about calcium requirements.

From such negative arguments it might be suggested that the conservative answer would be to insist on superabundant calcium intakes in case they might be useful. However, calcium deposition in tissues other than bones is definitely a real problem in old age. The possibility of promoting such deposits is not to be accepted lightly. Fortunately, however, the body's capacity to regulate its own calcium balance is such that the provision of a good ordinary intake—say 1 gm. daily—seems unlikely to promote either calcium depletion or deposition.

### *Salts*

The dietary supply of salt or, more specifically, of sodium, raises special questions because of the high incidence of hypertension and cardiac failure in the aged. In some hypertensive patients, rigid restriction of sodium intake is beneficial. High salt intakes are deleterious to the patient in or on the verge of cardiac failure. What then, should be the ad-

vice to the elderly person who does not have hypertension or exhibit indications of approaching cardiac failure?

Apparently moderate restriction of salt is of no benefit in the treatment or prevention of hypertension. Nor is there any evidence that moderate salt restriction will delay or prevent the cardiac failure which may develop on an ordinary salt intake. The very low sodium intakes prescribed in the treatment of hypertensive patients cannot be advocated except in real medical emergency; they impose an almost intolerable mode of life on the individual and pose a very serious problem in maintaining good nutrition.

The conclusion is that the elderly person would be well advised to avoid high sodium or high salt intakes but not to attempt serious restriction of either one. Unless the weather is excessively hot, a daily intake of 3 to 5 gm. of sodium chloride would be ample and would satisfy all ordinary tastes after a few days or weeks. In very hot weather and under other conditions which produce excessive perspiration, the salt intake should be increased to correspond with the fluid intake. Salt tablets are rarely desirable.

### **The Atherosclerosis Problem**

Atherosclerosis is unquestionably one of the most, or perhaps the most, serious health problem of old age. While this is a slowly developing condition, probably beginning far earlier than when old age is actually at hand, any possible influence of nutrition in old age upon this disease must receive close attention.

The incidence of atherosclerosis is much increased in obese persons, although it may occur in persons who have always been thin. Also, the development of atherosclerosis tends to be related to the level of cholesterol in the blood serum, although, again, it may occur in persons who have relatively low cholesterol values. The diet should be such as to prevent obesity—or to correct it if present—and, if possible, to keep the blood cholesterol level at a relatively low level.

Arguments that the amount of cholesterol in the diet may be reflected in the blood level are not supported by more critical studies of man.

Only at extremely high intakes—far above the cholesterol content of all ordinary diets—is there reason to believe that the dietary cholesterol has any influence on the blood level. But evidence is steadily accumulating that the fat intake in the diet has an important effect. The blood-serum cholesterol level rises on high-fat diets and falls on low-fat diets. Moreover, there seems to be no discernible difference between animal and vegetable fats in this respect.

### **Excretion and Dietary Bulk**

The incessant barrage of advertising of laxatives, cathartics, and bulk-formers is probably more responsible for the wide use of such materials by older people than any natural need. Many older people are, or think they are, troubled with constipation. A common tendency in old age to use diets which have small residues, coupled with the fact of smaller total food intakes, naturally leads to progressively smaller and less frequent stools. It is by no means clear that this is necessarily undesirable physiologically, but it often causes concern and resort to laxatives which may, in turn, disturb the orderly rhythm of excretion.

A more reasonable approach to the control of bowel regularity is to include in the diet foods which provide an appreciable residue for excretion—root and leaf vegetables, fruits, and whole grain or incompletely extracted cereals. Whole corn kernels are not recommended because they may be irritating. The specific addition of bran or ground cellulose is rarely desirable, in view of their irritating effect on the intestines. The constant use of mineral oil is objectionable for several reasons, including possible interference with the absorption of fat-soluble vitamins. Finally, a good deal of constipation would be “cured” if patients could be convinced that failure to have a bowel movement every day is not necessarily cause for alarm.

### **Longevity**

It might be presumed that a “good” diet should be, among other things, “good” for the achievement of maximum longevity. But this raises the question whether the best diet for

extending the years of life is also best in all other regards—maintenance of vigor, resistance to infection, wound healing, sheer enjoyment of life, and so on. In those animal species which have been studied, chronic underfeeding seems to be the surest way of achieving long life and, within limits, the life span is proportional to the degree of underfeeding, particularly when underfeeding is applied during the period of growth. The attainment in man of maximum longevity by such means is hardly desirable or practicable. Moreover, there is no evidence that underfeeding in old age would have any such effect.

### Nutritional Education

In old age, as at other ages, education is the most reliable way of assuring good nutrition. For older people who care for themselves, nutritional education cannot be stressed too much. Their nutritional knowledge lags far behind that of their younger contemporaries. Emphasis should be placed on practical matters, but the reasons behind the nutritional advice should be explained. The following may serve as reminders of important points to be covered.

1. A good diet is just as important in old age as in youth.
2. Overeating is more dangerous for the old than for the young.
3. Older people should be sparing in the use

of all fats and oils and should avoid cooking in fat.

4. The simplest way to assure adequacy of proteins, vitamins, and minerals is to use a varied diet made up of natural foods with a minimum of processing.

5. Cooking in large quantities of water is certain to result in losses of vitamins and minerals.

6. Liberal use of leafy and root vegetables, fruits, and coarse cereals will help control constipation. Failure to have a regular bowel movement every day is not constipation.

7. Bread enriched with milk solids and vitamins is desirable.

8. There should be an abundant fluid intake, and this may include moderate amounts of coffee, tea, and alcoholic beverages. The latter are best taken with, or immediately before, meals.

9. Meat, fish, or eggs every day should be the rule.

10. Special food concentrates and nostrums are seldom necessary. Peculiar and fancy diets should be avoided.

11. Moderate limitation in the use of table or cooking salt is wise.

12. A physician should be consulted if there are pronounced changes in weight or energy, or peculiarities of the skin, mucous membranes, or tongue. A periodic physical examination is advisable.

13. Food should be a source of pleasure and of health; the proper use of nutritional knowledge will help to assure that this is so.

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## Health Program in Ethiopian Road Building Project

The Public Health Service recently assigned a medical officer and a sanitary engineer to safeguard the health of 50 American engineers, their families, and 1,000 native laborers building a 700-mile highway in Addis Ababa.

At the request of the Government of Ethiopia, the highway is being constructed by the Bureau of Public Roads, United States Department of Commerce. World Bank funds are being used for the project.

The medical officer will operate a mobile medical clinic. He will be responsible for contacts with the National Ministry of Health and local medical personnel and hospitals, concerning his work and the care of patients.

The sanitary engineer will be in charge of planning and administering all sanitation measures for disease control, including water supply, food service, malaria control, and general sanitation problems.